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(19)(CA) **APPLICATION FOR CANADIAN PATENT** (12)

(54) Screening Arrangement

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(71) Same as inventor

(30) (ZA) 95/6374 1995/07/31

(57) 10 Claims

ABSTRACT

The invention provides for a securing means in the form of a pin for securing a screening panel to a support frame. The pin has a formation at its front end which is off center from the longitudinal center line of the pin and which causes the pin to tilt when it is driven through half tubular securing formations on the panel into a confined space. The pin also has a weakened region which facilitates flexing or even breaking of the pin when it is driven into a confined space.

BACKGROUND OF THE INVENTION

THIS INVENTION relates to a screening arrangement. More particularly the invention relates to securing means for securing screening panels for screening particulate material such as mineral ores or the like.

Different types of securing means for securing screening panels to a support frame are known to the applicant. One type of securing means comprises pins which are driven into tubular bores defined in pairs of half tubular protrusions located along the peripheral regions of screening panels. The pairs of half tubular protrusions fit into apertures provided in a support frame. When the pins are driven into the bores defined in the pairs of half tubular protrusions the pins spread the protrusions which thereby resist withdrawal from the apertures in the support frame and thereby secure the screening panels to the support frame. A difficulty which is sometimes encountered with the known pins is that in certain uses in confined spaces it may be difficult to remove the pins from the bores defined between the half tubular protrusions when it is desired to release the screening panels from the support frame.

It is an object of the invention to provide a securing means for securing screening panels to a support frame which overcomes or alleviates the difficulties sometimes encountered with known securing means.

SUMMARY OF THE INVENTION

According to the invention there is provided securing means for securing screening panels to a support frame, the securing means comprising a pin which can be driven into and through a tubular bore defined between a pair of half tubular protrusions on adjacent screening panels and which is elongate and which has a front end and rear end and a stem between the ends, and which further includes a formation at the front end which is located off center from the longitudinal center line of the pin and which causes the pin to tilt when axial pressure is applied to the pin while it is being axially restrained.

The pin may be of a resiliently deformable material, for example polyurethane, to enable it to flex when axial pressure is applied to the pin while it is being axially restrained.

The formation on the front end of the pin may have a tapering shape converging to a tip which may be a ridge or a sharp or rounded point.

The formation may in addition have a face sloping away from the tip and being inclined to the center line of the pin. The sloping face facilitates the tilting of the pin once tilting has been initiated by the tip while axial pressure is applied to the pin while it is being axially restrained. The sloping face may be a flat surface or may be a curved surface.

Further according to the invention there is provided securing means for securing screening panels to a support frame, the securing means comprising a pin which can be driven into and through a tubular bore defined between a pair of half tubular

protrusions on adjacent screening panels and which is elongate and which has a front end and rear end and a stem between the ends, and which further includes at least one weakened region which permits the pin to flex while axial pressure is applied to the pin while it is being axially restrained.

The weakened regions may comprise circumferentially extending grooves recessed radially into the stem. The degree of weakening of the weakened regions may be determined by the radial depth of each groove and by the longitudinal spacing between the grooves if a plurality of longitudinally spaced grooves are provided on the stem.

The degree of weakening of the weakened region or regions may be such that the stem can only withstand a predetermined degree of flexing and if this is exceeded the stem will break.

The rear end of the pin may include a radially projecting annular shoulder which is radially larger than the tubular bore defined between an adjacent pair of tubular protrusions so that when the pin is driven into the tubular bore the annular shoulder locates the pin axially in the tubular bore. The radial dimension of the annular shoulder may, however, be small enough so that by deformation it can be forced into the tubular bore when the pin is driven further into the bore.

BRIEF DESCRIPTION OF THE DRAWINGS

The invention is now described with reference to the accompanying drawings, in which:

Figure 1 - shows a fragmentary plan view of a screen deck including screening panels located on a support frame;

Figure 2 - shows on an enlarged scale a section on line II-II of Figure 1;

Figure 3 - shows on an enlarged scale a section on line III-III of Figure 1 with a pin in accordance with the invention about to be driven into the tubular bore defined between a pair of tubular protrusions on the screening panels;

Figure 4 - shows a view similar to Figure 3 but with the pin in position in the tubular bore and showing the spreading of the half tubular protrusions;

Figure 5 - shows a view similar to Figure 4 but with the pin driven further through the tubular bore until its front end abuts a surface of the frame and the pin is thereby axially restrained;

Figure 6 - shows a view similar to Figure 5 but with the pin driven further through the tubular bore and the formation on the front end of the pin tilting the pin and deflecting it to slide sidewardly along the support frame;

Figure 7 - shows a view similar to Figure 6 but with the pin breaking instead of sliding along the support frame;

Figure 8 - shows a side view of an alternative embodiment of a pin similar to the pin shown in Figure 3;

Figure 9 - shows a front view of the pin shown in Figure 8;

Figure 10 - shows a plan view of the pin shown in Figure 8; and

Figure 11 - shows a fragmentary plan view of adjacent screening panels in which an elongate recess is provided.

DESCRIPTION WITH REFERENCE TO THE DRAWINGS

Referring to Figure 1 and also to Figure 2, reference numeral 10 indicates in general a screen deck which includes a support frame 12 with a plurality of screening panels 14 mounted thereon. The support frame 12 includes a grid of spaced channels 16 secured to a base plate 18. Each screening panel 14 is of a hard wearing synthetic plastics material such as polyurethane and has a screening surface 20 including a plurality of screening apertures 22. Each screening panel 14 further has a plurality of half tubular protrusions 24 as shown in Figure 2. The half tubular protrusions on adjacent screening panels 14 fit in pairs in apertures 26 provided in the channels 16 as shown in Figure 2. Each pair of half tubular protrusions 24 define between them a tubular bore 28. The bore 28 has a step 30 forming a slightly larger bore 32. An annular recess 29 is provided between the bore 32 and the step 30. Only two screening panels 14 are shown in Figure 1, but it will be appreciated that a plurality of such panels may be mounted on the support frame 12.

Referring further to Figure 2, the tubular bore 28 has a converging region 34 defined between the half tubular protrusions 24 which has sloping faces 36. The half tubular protrusions 24 further have radially projecting shoulders 38 which engage the bottom edge of the channel 16 defining the aperture 26.

Referring to Figure 3, reference numeral 40 shows a pin which is of a suitable hard wearing material such as polyurethane about to be driven into the tubular bore 28 in the direction of arrow 42. The pin 40 has a front end 44, a rear end 46 and a stem 48 between the ends. An enlarged region 50 is provided on the stem 48 to facilitate the spreading of the half tubular protrusions 24 when the pin 40 is driven into the tubular bore 28. The front end of the pin 40 is tapered and converges to a tip 52 in the form of a point or a ridge which is off center by a distance 54 from the longitudinal center line 56 of the pin 40. The tip 52 includes a sloping face 58 which is inclined to the center line 56 and which leads to the stem 48. If desired the enlarged region 50 may be omitted and the stem 48 will then be of a uniform diameter in its axial direction.

A plurality of longitudinally spaced weakened regions in the form of circumferentially extending grooves 60 are provided on the stem 48. The grooves 60 are radially recessed into the stem 48 and facilitate the flexing of the pin 40 when axial pressure is applied to the pin in the direction of 42 while the pin is being axially restrained. The radial depth of the grooves 60 and the longitudinal spacing between the grooves determine the degree of flexing that is required in the pin 40. The radial depth of the grooves 60 may permit the pin 40 to flex only by a predetermined amount, whereafter, if the

predetermined amount of flexing is exceeded, the stem 48 will break if the axial pressure in the direction of arrow 42 is maintained.

The pin 40 further has a radially projecting shoulder 62 on its rear end 46. The annular shoulder 62 abuts the step 30 in the tubular bore 28 when the pin 40 is driven into the tubular bore and thereby the pin 40 is axially located in the tubular bore 28. In this position the annular shoulder 62 snap fits into the annular recess 29. The radial projection of the annular shoulder 62 is, however, small enough so that by resilient deformation of the shoulder and/or the regions of the screening panels 14 defining the tubular bore 28, the shoulder 62 can be forced over the step 30 and into the tubular bore 28 when the pin 40 has to be driven right through the tubular bore 28.

Referring further to Figures 2 and 3, it will be noted that the space 64 enclosed within the channel 16 and the base plate 18 is a confined space. It is, however, necessary that the pin 40 has to be driven in the direction of arrow 42 into the tubular bore 28 and right through the bore so that the pin can emerge into the confined space 64. The particular construction of the pin 40 as described above makes it possible for the pin 40 to be driven right through the tubular bore 28 and through the half tubular protrusions 24 into the confined space 64 so that thereby the half tubular protrusions 24 can be released and can be withdrawn through the apertures 26 in the channel 16 to thereby release the screening panels 14 from the support frame 12. Figure 3 shows the first stage of this operation with the pin 40 about to enter the tubular bore 28.

Referring to Figure 4, the next stage is shown of the pin 40 being driven into the tubular bore 40. The

annular shoulder 62 on the rear end 46 of the pin 40 is shown seating on the step 30 in the larger bore 32 leading into the tubular bore 28. In this position the enlarged region 50 on the stem 48 spreads the half tubular protrusions 24 apart and forces the projecting shoulders 38 on the protrusions 24 to be forced tightly underneath the rim of the channel 16 defining the aperture 26. Thereby the protrusions 24 resist withdrawal from the aperture 26, and as a result the screening panels 14 are secured to the support frame 12. In order to release the screening panels 14 from the support frame 12 the half tubular protrusions 24 have to be released from their spread out position so that they can be withdrawn from the aperture 26 in the channel 16. In order to achieve this the pin 40 has to be driven further through the tubular bore 28, and the next stage of this operation is shown in Figure 4.

Referring to Figure 5, the pin 40 is shown being driven through the tubular bore 28 and through the half tubular protrusions 24 until the formation 52 on the front end 44 of the pin 40 abuts the base plate 18 of the support frame 12. In this position the pin 14 is axially restrained and the axial pressure on the pin in the direction of arrow 42 is maintained. The next stage of the operation is shown in Figure 6.

Referring to Figure 6, when axial pressure is maintained on the pin 40 in the direction of arrow 42, the formation 52 at the front end 44 of the pin 40, by being off center by a distance 54 from the center line 56 of the pin 40, as shown in Figure 2, causes the pin 40 to tilt, and as the tilting increases under the maintained axial pressure, the pin 40 begins to flex and then to slide along the sloping face 58 along the base plate 18 until eventually it is freed from the half tubular protrusions 24 and slides horizontally in

the direction of arrow 66 to the horizontal position indicated in broken lines by reference numeral 40.1. Thus, although the pin 40 is too long to be accommodated vertically in the confined space 64, it can be accommodated in the horizontal position as shown by reference numeral 40.1. After the pin 40 has been released from the half tubular protrusions 24, the protrusions 24 can return to their relaxed condition in which they can be withdrawn from the aperture 26 and thus the screening panels 14 can be removed from the support frame 12.

Referring to Figure 7, an alternative stage to the stage of the operation shown in Figure 6 is shown of the pin 40 being driven through the tubular bore 28. In Figure 7 the circumferentially extending grooves 60 which form weakened regions in the stem 48 of the pin 40 are such that only a limited degree of flexing of the pin 40 is permitted. If this predetermined limited amount of flexing is exceeded the pin snaps at one of the weakened regions as shown in Figure 7, one portion moving in the direction of arrow 68 as shown by the broken lines 40.2, and the other portion moving in the direction of arrow 70 as shown by the broken lines 40.3. In this case also, even though the pin 40 is too long to be accommodated vertically in the confined space 64, the broken pieces 40.2 and 40.3 are small enough to be accommodated in the confined space 64. Thus, in this arrangement, the pin 40 can be driven right through the tubular bore 28 to release the half tubular protrusions 24 so that they can be withdrawn from the aperture 26 in the channel 16 so that thereby the screening panels 14 can be removed from the support frame 12.

Referring to Figures 8, 9 and 10, there is shown an alternative embodiment 80 of the pin 40 shown in Figures 1 to 7. The pin 80 is similar to the pin 40 and it functions in a similar manner except that the rear end 82 is rounded elongate instead of round as in the rear end 46 of the pin 40. The rounded elongate rear end 82 constitutes a locating formation which can seat in a recess 84 of a complementary shape in the screening panels 14 shown in Figure 11. The recess 84 is similar to the bore 32 shown in Figures 1 to 7 except that it is rounded elongate instead of round. When the rear end 82 seats in the recess 84 in a similar manner to the rear end 46 of the pin 40 seating in the round bore 32 as shown in Figure 4, the pin 80 is thereby located in a particular orientation with respect to the panels 14 and the channel 16. This will ensure that when the pin 80 is knocked through the recess 84 and the front end 44 strikes an obstruction such as the base plate 18 shown in Figure 6, the pin 80 will be deflected into a particular predetermined direction, more particularly into a direction into which there is space to be displaced into. Thus, when the long axis 86 of the rear end 82 is at right angles to the axis 88 of the front end 44 as shown in Figure 10, the front end and thus the pin 80 will be deflected into the direction 90 when the pin 80 is knocked through the bore 84. If it is desired to deflect the front end 44 and thus the pin 80 into the direction 92, the pin 80 should be constructed such that the front end 44 is in line with the long axis 86 as shown in broken lines in Figure 10.

It is an advantage of a pin forming a securing means in accordance with the invention that it can be used in confined spaces and can be driven right through the tubular apertures defined between half tubular protrusions on screening panels to be accommodated in the confined space so that thereby the screening panels can be released from the support frame.

CLAIMS

1. Securing means for securing screening panels to a support frame, the securing means comprising a pin which can be driven into and through a tubular bore defined between a pair of half tubular protrusions on adjacent screening panels and which is elongate and which has a front end and rear end and a stem between the ends, and which further includes a formation at the front end which is located off center from the longitudinal center line of the pin and which causes the pin to tilt when axial pressure is applied to the pin while it is being axially restrained.

2. Securing means as claimed in claim 1, in which the pin is of a resiliently deformable material.

3. Securing means as claimed in claim 1, in which the formation at the front end of the pin has a tapering shape converging to a tip.

4. Securing means as claimed in claim 3, in which the formation has a face sloping away from the tip and being inclined to the centre line of the pin and being adapted to facilitate the tilting of the pin once tilting has been initiated by the tip while axial pressure is applied to the pin while it is being axially restrained.

5. Securing means for securing screening panels to a support frame, the securing means comprising a pin which can be driven into and through a tubular bore defined between a pair of half tubular protrusions on adjacent screening panels and which is elongate and which has a front end and rear end and a stem between the ends, and which further includes at least one weakened region which permits the pin to flex while axial pressure is applied to the pin while it is being axially restrained.

6. Securing means as claimed in claim 5, in which the weakened region includes a plurality of circumferentially extending grooves recessed radially into the stem and in which the degree of weakening of the weakened region is determined by the radial depth of each groove and by the longitudinal spacing between the grooves.

7. Securing means as claimed in claim 5, in which the degree of weakening of the weakened region is such that the stem can only withstand a predetermined degree of flexing and if this is exceeded the stem will break.

8. Securing means as claimed in claim 1, in which the rear end of the pin includes a radially projecting annular shoulder which is radially larger than the tubular bore defined between an adjacent pair of tubular protrusions so that when the pin is driven into the tubular bore the annular shoulder locates the pin axially in the tubular bore.

9. Securing means as claimed in claim 1 in which the pin includes a locating formation which locates the pin in a predetermined orientation with respect to the tubular bore and the support frame so that when the pin is driven through the bore it will emerge from the bore in a predetermined direction with respect to the support frame.

10. Securing means as claimed in claim 9, in which the locating formation is provided on the rear end of the pin and comprises an elongate head with rounded ends which can seat in a complementarily shaped recess in the tubular bore.

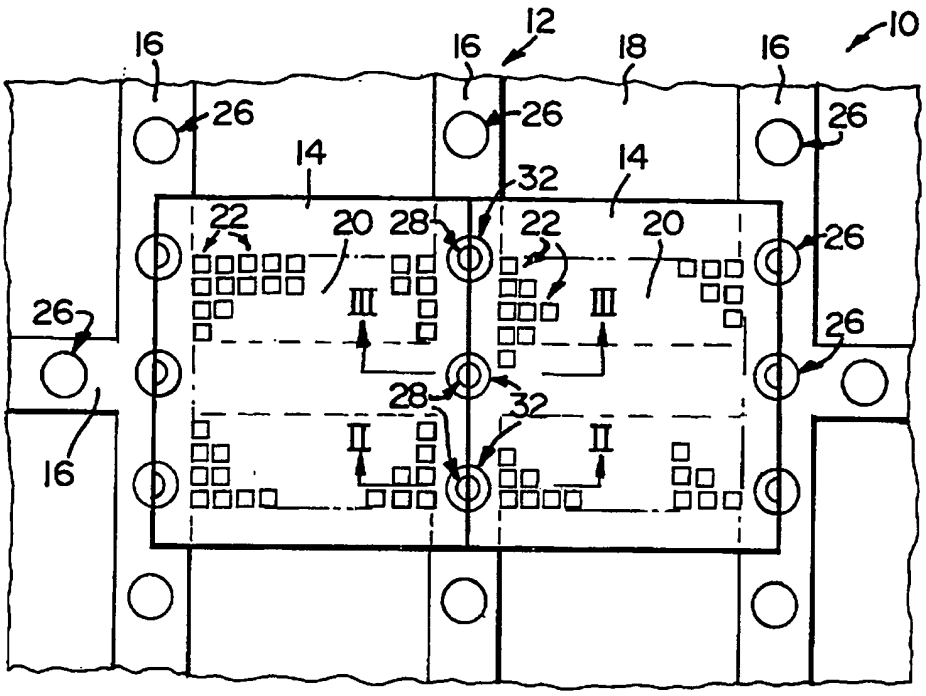
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FIG 1

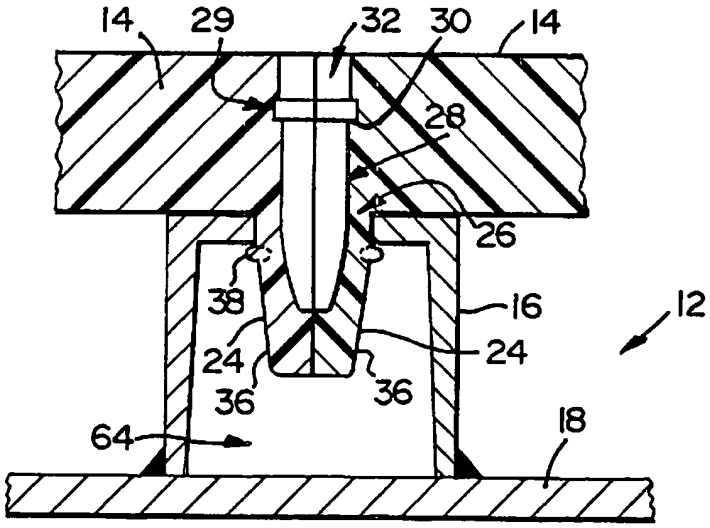
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FIG 2

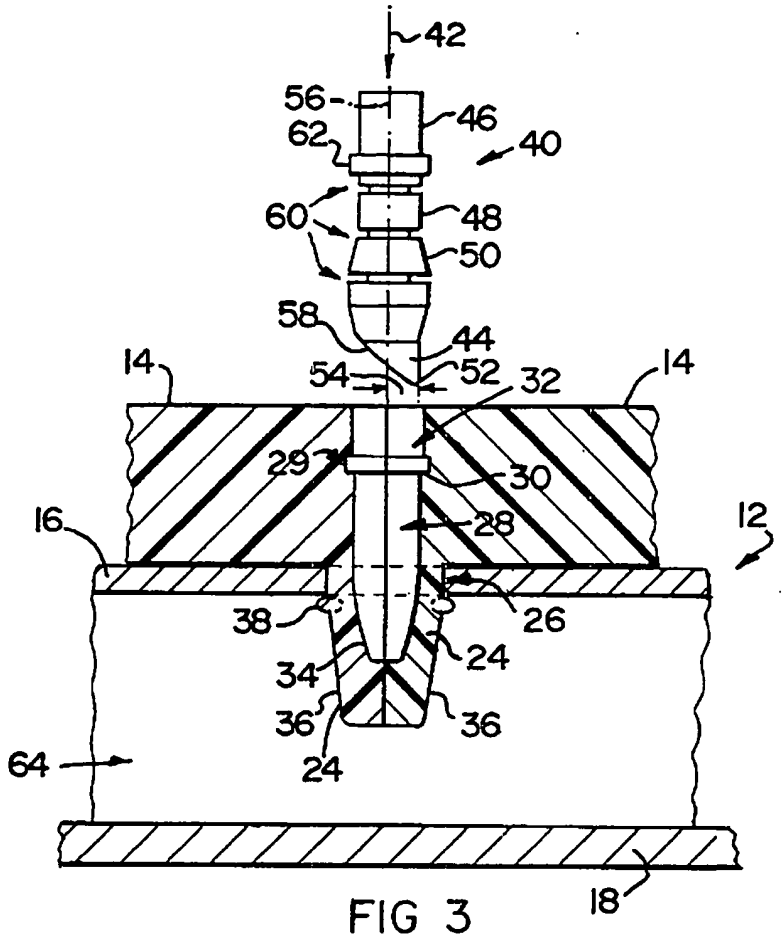
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FIG 3

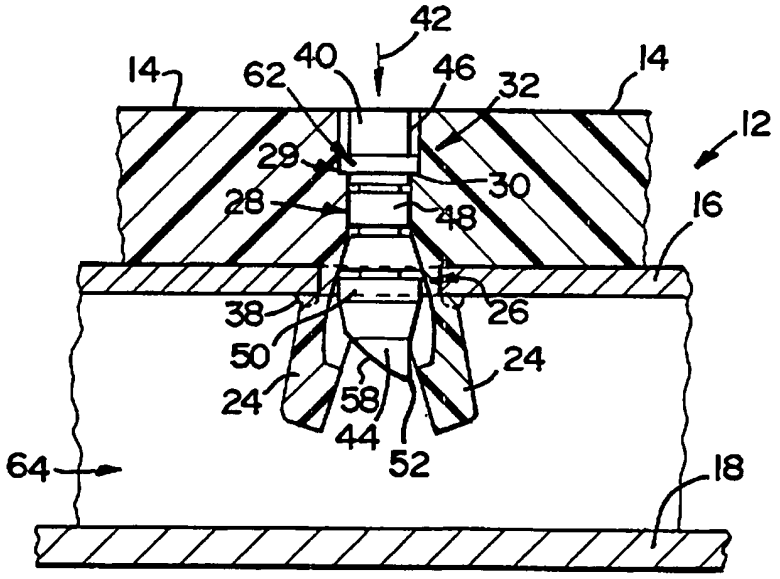
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FIG 4

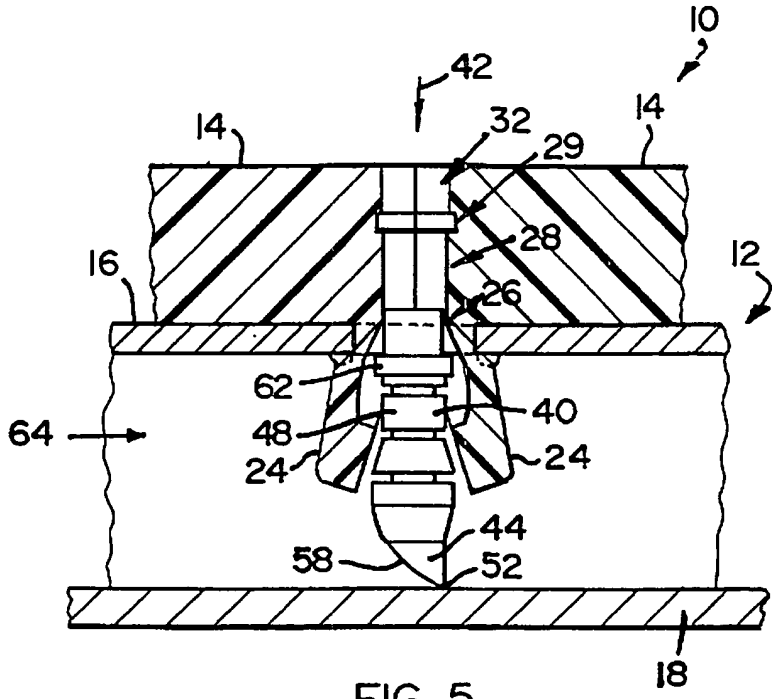
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FIG 5

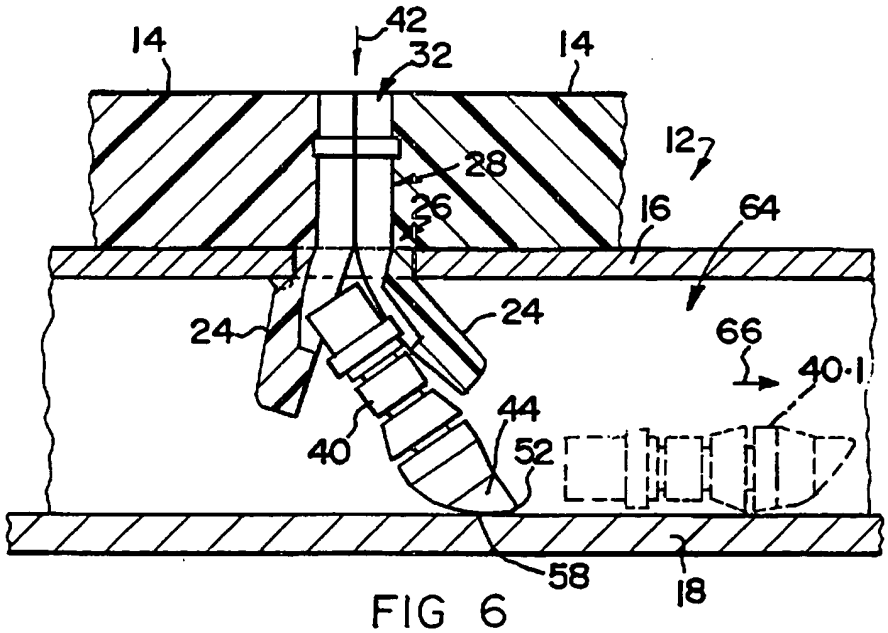
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FIG 6

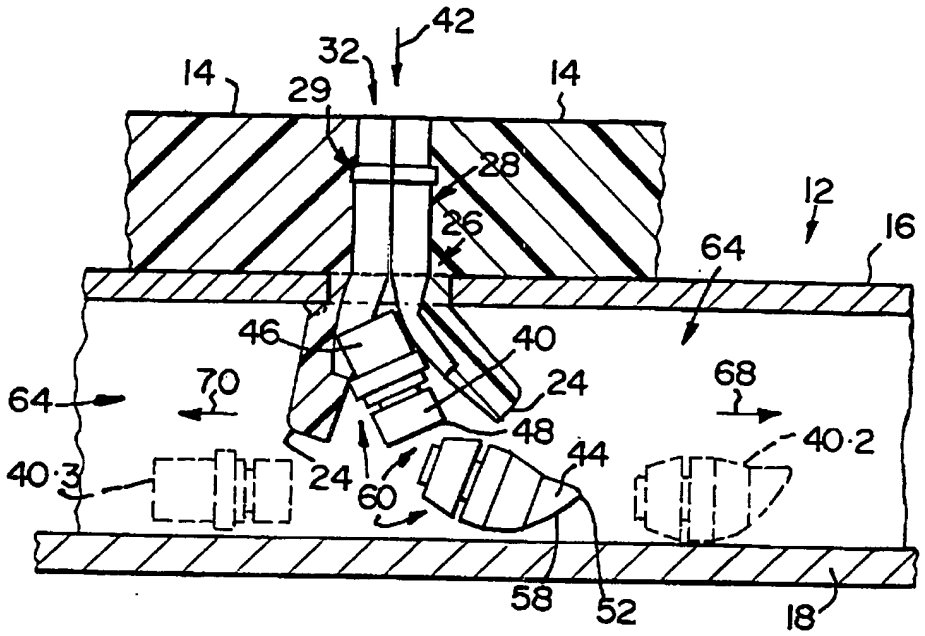

FIG 7

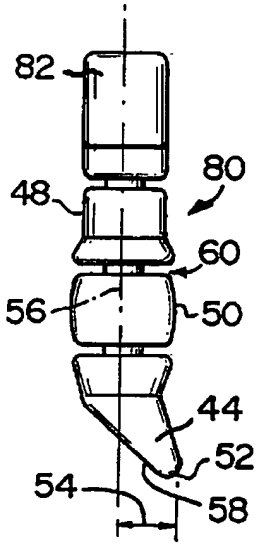

FIG 8

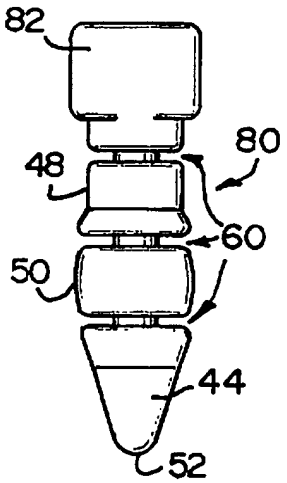

FIG 9

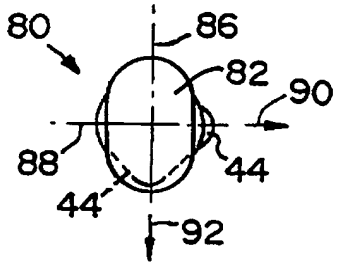

FIG 10

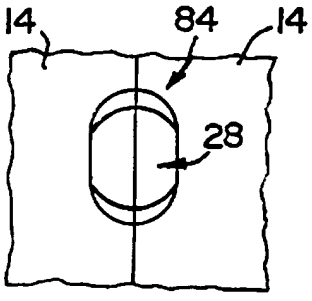

FIG 11